

**OXYGEN DOPING METHOD TO GALLIUM NITRIDE SINGLE
CRYSTAL SUBSTRATE AND OXYGEN-DOPED N-TYPE GALLIUM
NITRIDE FREESTANDING SINGLE CRYSTAL SUBSTRATE**

ABSTRACT OF THE DISCLOSURE

5 Oxygen can be doped into a gallium nitride crystal by preparing a non-
C-plane gallium nitride seed crystal, supplying material gases including
gallium, nitrogen and oxygen to the non-C-plane gallium nitride seed crystal,
growing a non-C-plane gallium nitride crystal on the non-C-plane gallium
nitride seed crystal and allowing oxygen to infiltrating via a non-C-plane
10 surface to the growing gallium nitride crystal.

 Otherwise, oxygen can be doped into a gallium nitride crystal by
preparing a C-plane gallium nitride seed crystal or a three-rotationally
symmetric plane foreign material seed crystal, supplying material gases
including gallium, nitrogen and oxygen to the C-plane gallium nitride seed
15 crystal or the three-rotationally symmetric foreign seed crystal, growing a
faceted C-plane gallium nitride crystal having facets of non-C-planes on the
seed crystal, maintaining the facets on the C-plane gallium nitride crystal and
allowing oxygen to infiltrating via the non-C-plane facets to the gallium
nitride crystal.

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